

PCB LEAK CLEANUP PLAN
KAISER ALUMINUM & CHEMICAL CORPORATION
TACOMA, WASHINGTON FACILITY

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INTRODUCTION

This plan outlines completed and proposed activities taken at the Kaiser Aluminum and Chemical Corporation (Kaiser) facility in Tacoma, Washington, in response to a recent leak of transformer oil containing low concentrations of PCB. The plant is located in the Tacoma tideflats industrial area near the base of the manmade peninsula that separates the Hylebos and Blair Waterways. The leak occurred in the rectifier yard located in the south-central portion of the plant. This plan includes a description of events leading up to and following the leak, a soil sampling and action plan, and a ground water monitoring plan.

Many factors must be taken into consideration when designing a sampling and analysis plan for cleanup of leaked materials. These considerations include the quantity of leaked material, the concentration of contaminants in the leaked material, the potential for offsite migration of the contaminants, and the potential for human contact with the contaminants. This plan reflects the relatively low concentrations of PCBs in the leaked oil, the high retardation rates associated with PCB that reduce its mobility in ground water, and restricted public access to the leak site. The plan is also responsive to existing PCB cleanup policies and approaches by the Washington Department of Ecology (WDOE) as communicated during ongoing coordination with Kaiser (1986) and the U.S. Environmental Protection Agency (EPA 1986).

SEQUENCE OF EVENTS

On Friday, 19 December 1986, at approximately 11:00 AM, it was conclusively determined that a significant amount of transformer fluid had been lost during Kaiser's attempts to refill Transformer 13 during reinstallation after maintenance. Initial checking indicated that perhaps as much as 3000 gallons of transformer fluid, containing between 10 and 15 parts per million (ppm) PCB, were lost after attempting to pump the transformer fluid from a storage tank via an underground line to Transformer 13. An inspection of a nearby basement sump system revealed that some oil was collecting on the surface of two of the three sumps and in some associated drainage troughs. Pumps evacuating the two contaminated sumps were shut down at approximately 10:00 AM. The third sump appeared to be clear and was allowed to continue discharging to the storm sewer.

Visual observations were made, and samples were taken, at various points in the plant storm sewer system to determine whether any oil had been discharged to the settling pond.

At 1:35 PM, Mr. David Davies of WDOE was notified of the spill and activities underway. Mr. Davies arrived at 4:00 PM and toured the rectifier yard and basement areas involved in the spill.

At 3:00 PM, a pressure test of a buried transfer line revealed that it was indeed cracked at a "riser" near the VR2A transformer. This riser was located approximately 40 feet from the basement sumps initially showing oil contamination.

Later that day, Kaiser contracted with General Electric for assistance in controlling leaked materials. Pumping of the two

contaminated sumps into storage drums was begun at approximately 6:00 PM. The "clean" sump continued to discharge to the storm sewer. Samples were taken from this clean sump twice daily to assure that oil contamination did not occur. The source of water to this sump can not be determined from existing drawings.

At 8:30 PM, Ms. Anita Frankel of the EPA, Region X, was contacted. The WDOE had already reported the spill to the EPA. The National Spill Response Center was notified on 23 December 1986.

A reconstruction of events as now understood is summarized as follows:

1. In April 1986, a contractor was used to remove and replace contaminated gravel near the VR2A transformer. Damage to a riser pipe on the transformer fluid transfer system may have occurred during this operation. The transfer system was not subsequently used until maintenance work on Transformer 13 was undertaken.
2. On 21 October 1986, approximately 3000 gallons of transformer fluid (10-15 ppm PCB) was pumped from Transformer 13 to a storage tank approximately 200 feet away. No measurement of transformer fluid was taken at either the transformer or storage tank after this transfer was completed. Transformer 13 was removed from the plant for maintenance.
3. On 11 December 1986, Transformer 13 was reinstalled. Between approximately 7:00 PM and 11:00 PM, the transformer fluid was pumped from the storage tank back to the transformer. It is likely that all or most of the leakage of

PCB-containing fluid occurred at this time, rather than during the October transfer. Oil was initially observed in nearby sumps and drainage troughs only 8 days after this transfer. This indicated time for leaked oil to travel to the sumps is reasonable in consideration of (a) the proximity of the leak site (40 feet) to the sump well and troughs; (b) soil and drainage conditions near the leak site; (c) the effects of sump pumping; and (d) the orientation of the leak opening in the riser toward the basement wall. The "fill" indicator on the transformer was not triggered at the time of this transfer; however, this was not considered abnormal since some fluid may have remained in the unit at the time it was transported for offsite maintenance and may have been removed for use in another unit by the maintenance contractor. Plans were to "top-off" the unit later.

4. On 12 December 1986, an additional 605 gallons of PCB-free transformer fluid were pumped through the system to Transformer 13. Still the unit did not "top-off".
5. On 18 December 1986, an additional 550 gallons of PCB-free transformer fluid were pumped through the system. When this also failed to "top-off" the system, the area supervisor was contacted and began the investigation that culminated in the conclusion that a loss of fluid had occurred.

Subsequent analysis concluded that approximately 2896 gallons of transformer fluid was leaked (Kaiser 1986). The

maximum PCB level in the leaked fluid is in the 10-15 ppm range; it is anticipated that some of the leaked fluid was PCB-free.

Pumping of the contaminated sumps into drums continued around the clock until 26 December 1986. At 9:00 AM, the third and highest flowing sump became visually contaminated. At this point, discharge to the storm sewer from this sump also was stopped. An immediate survey was taken of the storm sewer man-holes, pump stations, and both surface ponds to verify that no oil had been inadvertently discharged to the storm system. None was identified, and subsequent samples at key points indicate that no identifiable contamination occurred.

Because of the high flow of the third sump, discharge to barrels became impractical. Northwest Enviroservices was contracted to supply tankers and personnel to continuously pump all sumps and remove the oil/water mix for proper disposal. Alternative methods of handling were investigated. A design for an oil/water separator was developed, and a plan to discharge resulting "treated" water to the Tacoma Sewage Utility was devised and implemented.

The separator began receiving sump discharge on 31 December 1986, at 10:30 PM. Northwest Enviroservices continued to handle the "treated" water until PCB levels within the product from the system could be determined and a discharge permit could be obtained from the sewage utility. On 6 January 1987, at 2:30 PM, the discharge permit was approved. Approximately 8500 gallons per day has been discharged to the sanitary system since that time. Oil being reclaimed is still being held in the separator.

PCB levels in the "treated" water have been at or below the level of detection of 0.1 parts per billion (ppb).

Approximately 150,000 gallons of oil/water was handled by Northwest Enviroservices. Approximately 750 gallons of oil was separated by their facility. Approximately 100 drums of oil/water mix (oil content unknown) remains in drums in Line 5. Oil is currently being reclaimed by the separator at a very low (as yet undetermined) rate.

REMEDIAL ACTION TAKEN TO DATE

Site containment/cleanup activities undertaken thus far are as follows:

1. Two sumps have been installed to below the ground water level. One is near the BPA fence, approximately 40 feet directly south of the leak site. The second is at the leak site. Significant oil is visible in the sump at the leak site. Weekly sampling of this sump has been conducted. No oil has been detected at the sump near the fence.
2. An attempt to install a "cut-off" trench proved not to be feasible because of the soil conditions and the significant interference by plant underground and overhead utilities.
3. Basement sump pumping is automated and routed to the oil/water separator, which discharges treated water to the sanitary system.
4. The oil transfer system which leaked has been abandoned permanently. Future oil transfers will be made by using above-ground flexible lines.

5. Access to the site has been further restricted to a "need only" basis. It should be noted that this leak occurred in an area that has always been "limited access", even to plant personnel, because of the inherent electrical dangers.
6. Soil removed during construction of the sump at the leak site was transported to the Arlington, Oregon waste disposal site.

While the WDOE has been involved and informed regarding day-to-day activities, the purpose of this report is to present, for WDOE approval, a final plan outlining additional investigative and remedial actions designed to control environmental risks associated with this leak.

GROUND WATER

GROUND WATER CONDITIONS

Previous investigations (Dames & Moore, 1985) have confirmed the existence of shallow, intermediate, and deep water-bearing zones within 50 feet of the ground surface and a deep confined production aquifer encountered at depths of 600 feet or more. Long-term monitoring (1981-1987) of ground water quality in the three near-surface water-bearing zones indicate that contamination associated with past practices at the site (cyanide, fluoride, PAHs) is limited to the shallow and intermediate zones.

Well locations and ground water elevation contours developed for the wet scrubber sludge management area and spent potlining management facility closure are shown on Figures 1 through 5. These data indicate that seasonal variations in ground water flow

direction and velocity occur in the shallow and intermediate water-bearing zones underlying the plant site.

The shallow water-bearing zone shows the strongest seasonal level variation. Between July and November observations, water levels in the shallow water-bearing zone increased and the northwest trending divide near wells L and AA shifted to the southwest (Figures 2 and 4). Contours indicate that the shallow water-bearing zone is influenced by drainage towards the Hylebos waterway and the Kaiser ditch and by the pre-fill drainage surface (Bortleson, et. al. 1980).

Ground water data for the plant indicate that the leak site is at or slightly to the northeast of the time average ground water divide between the Hylebos and Blair Waterways. Therefore, ground water flow beneath the leak site could be towards either waterway. However, local ground water flow in the shallow water-bearing zone is primarily affected by the pumping of nearby basement sumps to the west and northwest of the leak site. This is illustrated by Figure 6, which shows the relative ground water levels in the sumps and in wells G and J, the closest monitoring wells to the leak site.

GROUND WATER MONITORING PROGRAM

Selected wells in the existing ground water monitoring system at the Kaiser plant (G, J, and K) will be used to monitor ground water levels and quality (Figure 7). In addition, two new well clusters (each comprised of a shallow and intermediate well) will be installed to monitor ground water flow and quality in the vicinity of the spill.

One new well cluster will be placed to the south of the leak site (on adjacent Bonneville Power Administration (BPA) property) and one to the north of the rectifier building (Figure 7). Four-inch inside diameter (ID) PVC casings will be used for the wells to facilitate sampling and permit future cleanup/recovery programs (if necessary). The proposed well design for the 4-inch diameter wells is presented on Figure 8.

All new wells in the monitoring system will be sampled for PCBs upon completion and development. Water levels will also be measured immediately after well completion and at quarterly intervals to supplement the current understanding of ground water flow direction and rates in the shallow and intermediate water-bearing zones.

The two new well clusters will be sampled quarterly for PCB for one year. Wells G, J, and K will be sampled semi-annually, and other selected wells in the monitoring system may be sampled for PCB as appropriate based on observed conditions or monitoring results. Ground water in the sump near the BPA fence will be observed weekly for the presence of oil. Ground water sample collection and handling procedures are presented in Appendix A. Quality assurance/quality control (QA/QC) procedures are presented in Appendix B.

If concentrations of PCBs are detected in ground water in excess of 1 ppb at the new wells, the WDOE will be notified and a new action plan will be developed. Additional activities could include additional monitoring or withdrawal wells which would supplement ongoing PCB removal.

Drums containing an oil/water mix that are currently stored along Line 5 will be transported to Northwest Enviroservices for appropriate disposition.

SOIL

SOIL CONDITIONS

PCB concentrations in the leaked oil range from 10 to 15 ppm (Kaiser 1986). The leak occurred in near-surface soil which, based on data from previous investigations (Dames & Moore, 1985), is comprised of loose, silty fine-to-coarse sand. This soil material has a typical in-place dry density of approximately 100 pounds per cubic foot (Hough, 1957); the resulting porosity of the soil is approximately 40 percent by volume. Assuming that the leaked oil (with a specific gravity of 0.87) occupies 100 percent of the voids, the resulting maximum concentration of PCB in the soil matrix would range from 1.8 to 2.3⁷ ppm (Table 1). Actual PCB concentrations in soil should be significantly less (except in the immediate vicinity of the leak) due to: (1) less than saturated conditions existing above the water table in the shallow water-bearing zone, and (2) the presence of ground water in soil both above and below the water table, reducing the void space available for PCB-contaminated soil.

SOIL SAMPLE LOCATIONS

Sampling will be conducted within a circular area to standardize sample design and layout in the field and to ensure that the sampling extends into areas not contaminated by the leak. The center of the circle will be the point of the leak.

Sampling points will be staked out in a 20-foot radius using a hexagonal grid with 10-foot sample point spacing. Sampling points that land in impervious areas (e.g. buildings, concrete foundations) will be moved to the nearest location within 5 feet where soil can be collected. If no feasible soil sampling site exists within 5 feet of the initial sample location, the sampling point will be omitted. Approximate sample locations are shown in Figure 9. A total of 16 locations will be sampled using the following method:

1. Samples of the surface soil will be collected using a post-hole digger at a depth of 0.5 feet at each site identified on Figure 9. Soil samples will be labeled and transported to the laboratory in a cooler.
2. A detection limit of 1 ppm PCB will be established. If analysis results are below the detection limit, no action will be taken. If PCBs are detected within a grid segment, another soil sample will be taken at 1.5 feet and the soil within that segment will be removed to a depth of 1 foot and replaced with clean soil.
3. If analysis of soil collected at 1.5 feet shows concentrations of PCB to be greater than 1 ppm, the WDOE will be notified and a notice will be included in the deed concerning the presence and location of elevated PCB concentrations.

SOIL SAMPLE ANALYSIS

The sampling scheme will result in the submittal of at least 16 soil samples for analysis. Because it is important to obtain

certifiable results in defining concentrations and extent of the spill, U.S. EPA-approved methods for PCB analysis (EPA Method 8080), reported on a dry-weight basis, will be performed on the samples. Results will be calibrated against a best-fit Aroclor standard. If additional analyses are required to further define areas of contamination or concentration gradients, less expensive and more rapid screening methods will be used. Quality control samples will consist of the following:

- o A field blank, consisting of a surface wipe from the sampling equipment after decontamination between sample collection, placed in a blank sample jar.
- o Duplicate sample prepared in the field.
- o A laboratory method blank that accompanies sample analysis.
- o A laboratory replicate analysis.
- o A laboratory spike analysis that accompanies sample analysis.

Additional QA/QC procedures for soil sampling and collection are presented in Appendix B.

SUMMARY OF REMEDIAL ACTION

The following actions will be undertaken by Kaiser to detect, analyze, and control the movement of leaked transformer oil containing PCBs at the Kaiser facility rectifier yard.

- o Two new well clusters will be established at locations north and south of the transformer oil leak. Two wells will be located at each cluster; one will be screened in the shallow

water-bearing zone and one will be screened in the intermediate water-bearing zone at each location. Ground water samples will be collected quarterly and tested for PCBs. Semi-annual sampling will also be conducted at existing monitoring wells G, J, and K and analyzed for PCBs. If PCB concentrations in ground water exceed 1 ppb, Kaiser will notify WDOE and a new action plan will be developed.

- o Oil will be periodically skimmed from the leak site sump and collected in the oil/water separator for future transport to Northwest Enviroservices for appropriate handling.
- o The sump near the BPA fence will be observed weekly for the presence of oil and sampled monthly.
- (o The approximately 100 drums containing an oil/water mix currently stored in Line 5 will be transported to Northwest Enviroservices for appropriate handling.
- o Soil samples will be collected at a depth of 0.5 feet at established grid points within 20 feet of the leak site. Where PCB concentrations in soil samples exceed the established detection limit of 1 ppm, an additional soil sample will be collected at a depth of 1.5 feet. If concentrations in the lower sample exceed the detection limit, this information will be noted in the deed. All soil to a depth of 1 foot will be removed and replaced with clean fill at grid sections where PCB detection limits are exceeded in soil. All removed materials will be transported to an approved disposal site.

REPORT

After receipt of soil sampling data from the laboratory, a sampling and analysis report will be prepared that includes a map of the sampling points, sampling methods and notes, laboratory data, quality control results, and discussion of results and recommendations regarding further data collection and cleanup activities.

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#7 Duplicate
#6 Down- #7
Below stream Downstream
Outfall Outfall Outfall

ORGANIC ACID AND BASE-NEUTRAL COMPOUNDS

4-Methylphenol	ug/kg	110	ND
Phenanthrene	ug/kg	750	5500
Anthracene	ug/kg	130	ND
Fluoranthene	ug/kg	3300	12000
Pyrene	ug/kg	3400	11000
Benzo(a)Anthracene	ug/kg	1400	2500
Chrysene	ug/kg	5000	6600
Bis(2-Ethylhexyl)Phthalate	ug/kg	930	1600
Benzo(b)Fluoranthene	ug/kg	3000	3200
Benzo(k)Fluoranthene	ug/kg	1300	2000
Benzo(a)Pyrene	ug/kg	650	ND
Indeno(1,2,3-cd)Pyrene	ug/kg	440	ND
Dibenzo(a,h)Anthracene	ug/kg	210	ND
Benzo(g,h,i)Perylene	ug/kg	550	ND

PESTICIDES - NONE DETECTED

POLYCHLORINATED BIPHENYLS

PCB, A-1248	ug/kg	ND	1800
PCB, A-1260	ug/kg	345	ND

VOLATILE ORGANIC COMPOUNDS

Acetone	ug/kg	ND	54.5
Methylene Chloride	ug/kg	41.7	40.0
Chloroform	ug/kg	5	5.5

METALS

Arsenic	ug/g	58	65	67
Antimony	ug/g	5.3	4.0	6.6
Barium	ug/g	Not analyzed		
Beryllium	ug/g	0.80	0.80	0.70
Cadmium	ug/g	<0.200	<0.200	<0.200
Chromium	ug/g	47	38	41
Copper	ug/g	140	130	120
Mercury	ug/g	0.040	0.020	0.018
Nickel	ug/g	46	34	33
Lead	ug/g	72	56	56
Selenium	ug/g	0.300	<0.28	<0.28
Silver	ug/g	<1.0	<1.0	<1.0
Thallium	ug/g	5.8	1.00	0.90
Zinc	ug/g	190	240	220
Aluminum	ug/g	24000	21000	21000

CYANIDE ug/g <0.6 <0.6

OTHER

Fluoride	ug/g	20.4	15.3
Phenol	ug/g	1.17	<0.8

NOTE: Compounds Below Detection Limit are NOT Listed

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S1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

I. LIMITS AND MONITORING

A. Outfall 001: Industrial Wastewater Discharge from Settling Basin to Hylebos Waterway (a)

From the issuance date of this permit, the Permittee is authorized to discharge from outfall No. 001, subject to the following limitations and conditions:

<u>Parameter</u>	<u>Effluent Limits</u>		<u>Monitoring Requirements</u>	
	<u>Monthly Average</u>	<u>Daily Maximum</u>	<u>Frequency</u>	<u>Sample Type</u>
Total Suspended Solids (TSS)	160.0 lbs/day	320.0 lbs/day	Daily	Composite
Fluoride	80.0 lbs/day	240.0 lbs/day	Daily	Composite
Aluminum	25.0 lbs/day	50.0 lbs/day	Daily	Composite
Oil & Grease		10.0 mg/l	Daily	Grab
Benzo(a)pyrene (a)		0.01mg/l	Weekly	Composite
Cyanide, Free (b)		0.01mg/l	Weekly *	Composite
PCBs, Total (c)		0.003mg/l	Quarterly	Grab
Nickel		0.01mg/l	Weekly *	Composite
Copper (d)			Weekly *	Composite
pH (e)	6.0 to 9.0 at all times		Continuous	Continuous
Temperature °F			Continuous	Continuous
Flow, MGD			Continuous	Continuous
Precipitation, inches as rain (f)			Daily	24-hour
Aluminum Metal Production, tons/day				Daily Average

Discharge and Monitoring Definitions and Explanations

- The monthly average is defined as the sum of all daily discharges divided by the number of daily discharges measured during the calendar month.
- The daily maximum is defined as the highest allowable daily discharge during the calendar month.
- Composite is defined as a 24-hour or 72-hour flow or time proportional sample, whichever is most representative of the discharge.
- Daily composite monitoring is defined as four (4) 24-hour composite samples and one (1) 72-hour composite sample per week; daily grab monitoring is defined as five (5) days per week; weekly monitoring is defined as one (1) day per week; quarterly monitoring is defined as four (4) days evenly spaced out per year, i.e., approximately once every ninety (90) days; and daily precipitation monitoring is defined as seven (7) days per week.